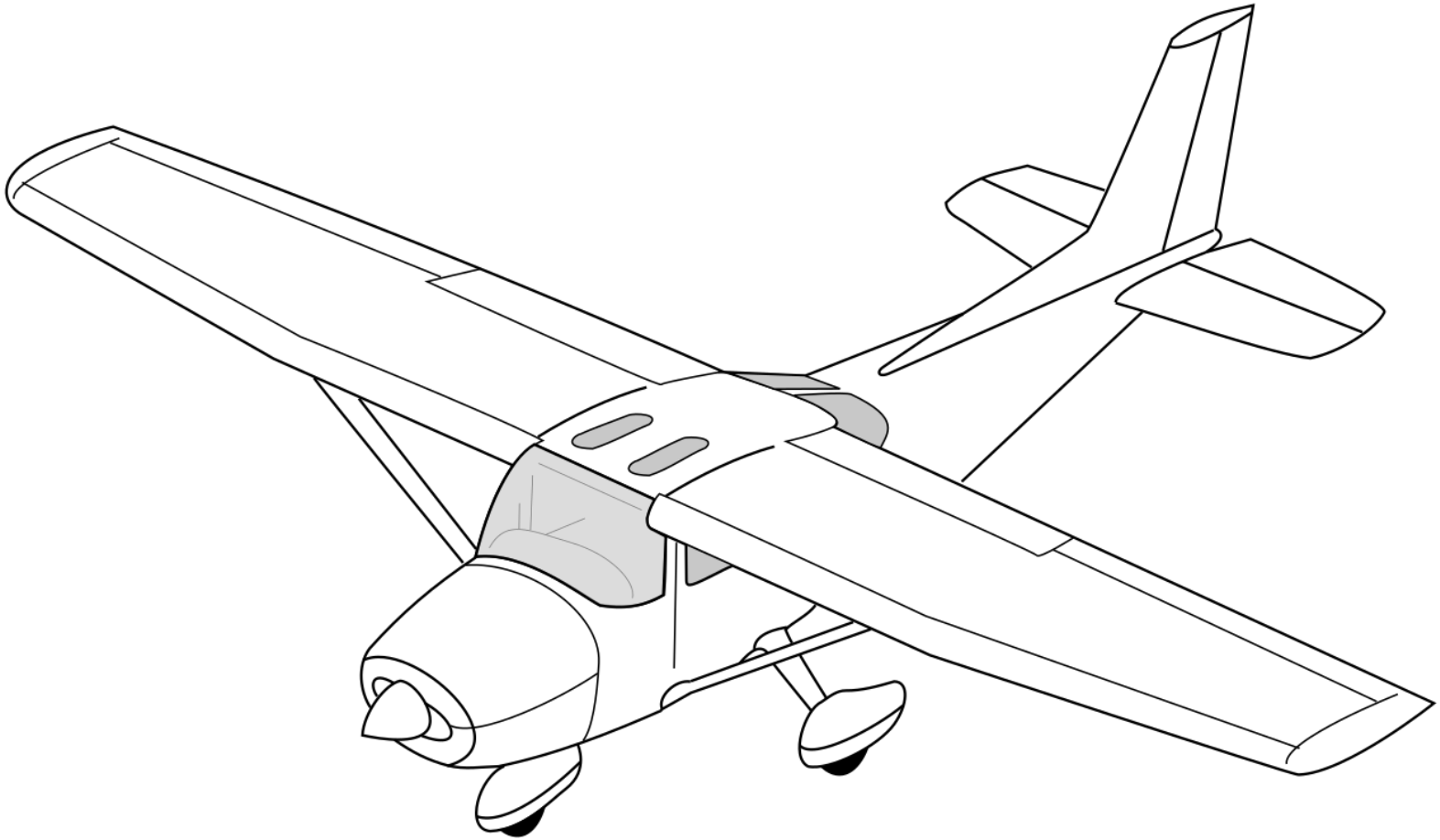
Aircraft Systems

Chapter 2

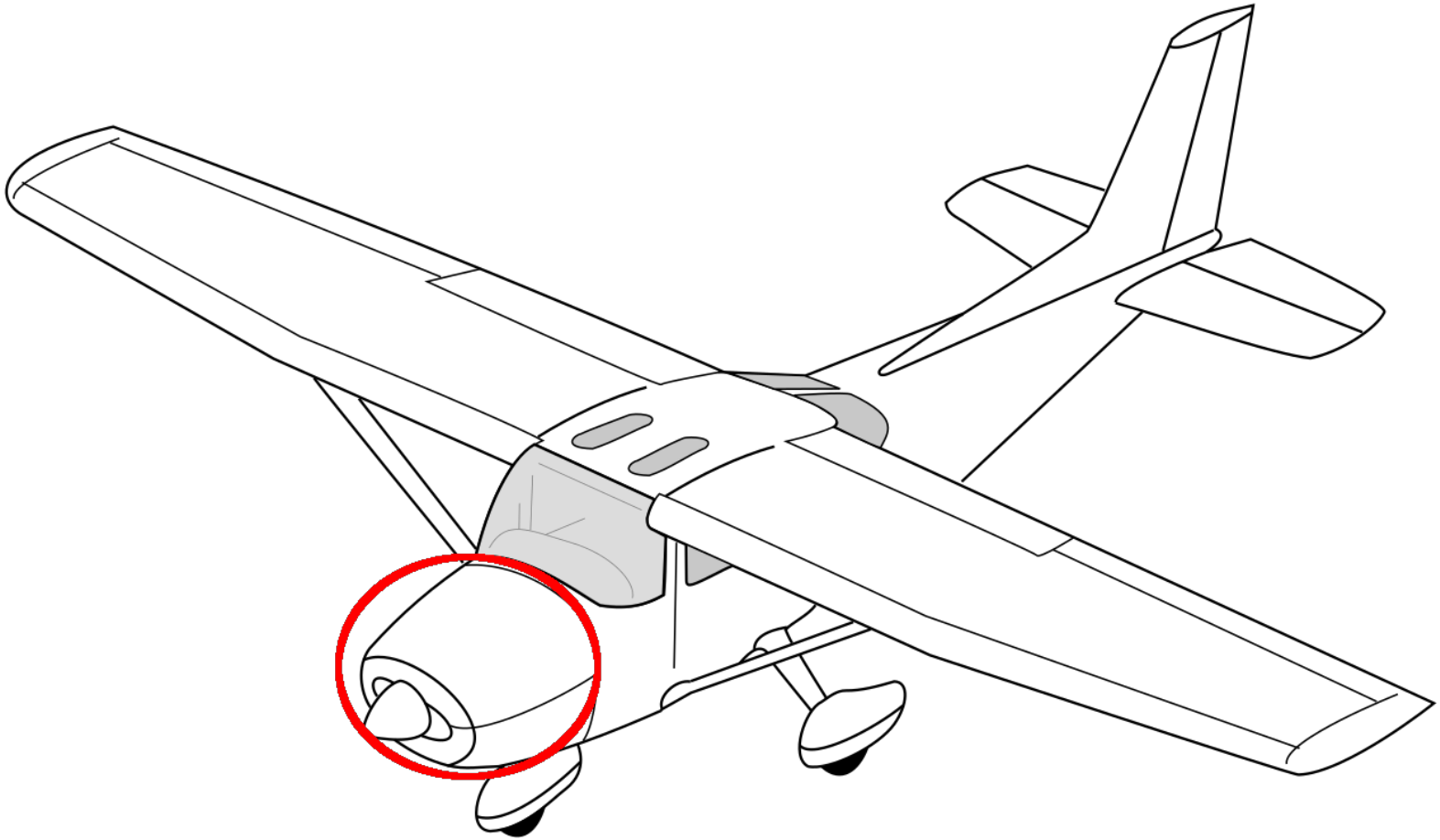
Questions

1. What is the difference between *detonation* and *preignition*?
2. What could be wrong if the engine continues to run with the master switch in the off-position?
3. After crossing the Cascades I reduced power and the decent was uneventful. However, upon reaching the bottom of decent over Lake Whatcom, the engine was very rough and delivered no meaningful power. What did I forget to do?
4. There is an old saying among long duration bicyclists that lots of peddling means good knees. That is, choosing a slightly lower gear that requires more peddling is better for your knees than a higher gear and less peddling. Why?
5. Why should you avoid low-rpm and high manifold pressures?
6. While automotive turbochargers and aviation turbochargers provide forced induction, how do their purposes differ?
7. What are the four strokes of a *diesel* engine?

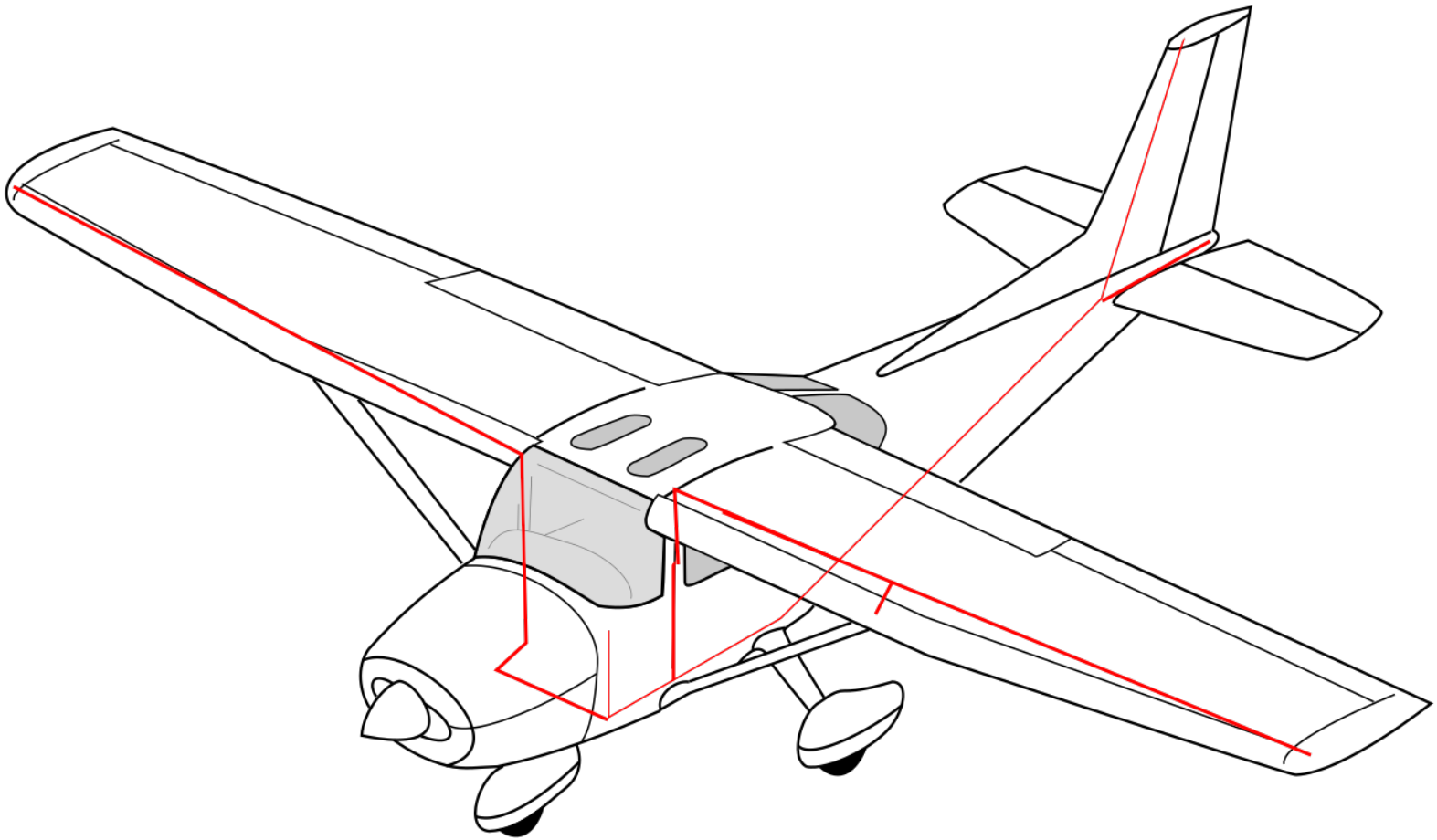
Systems



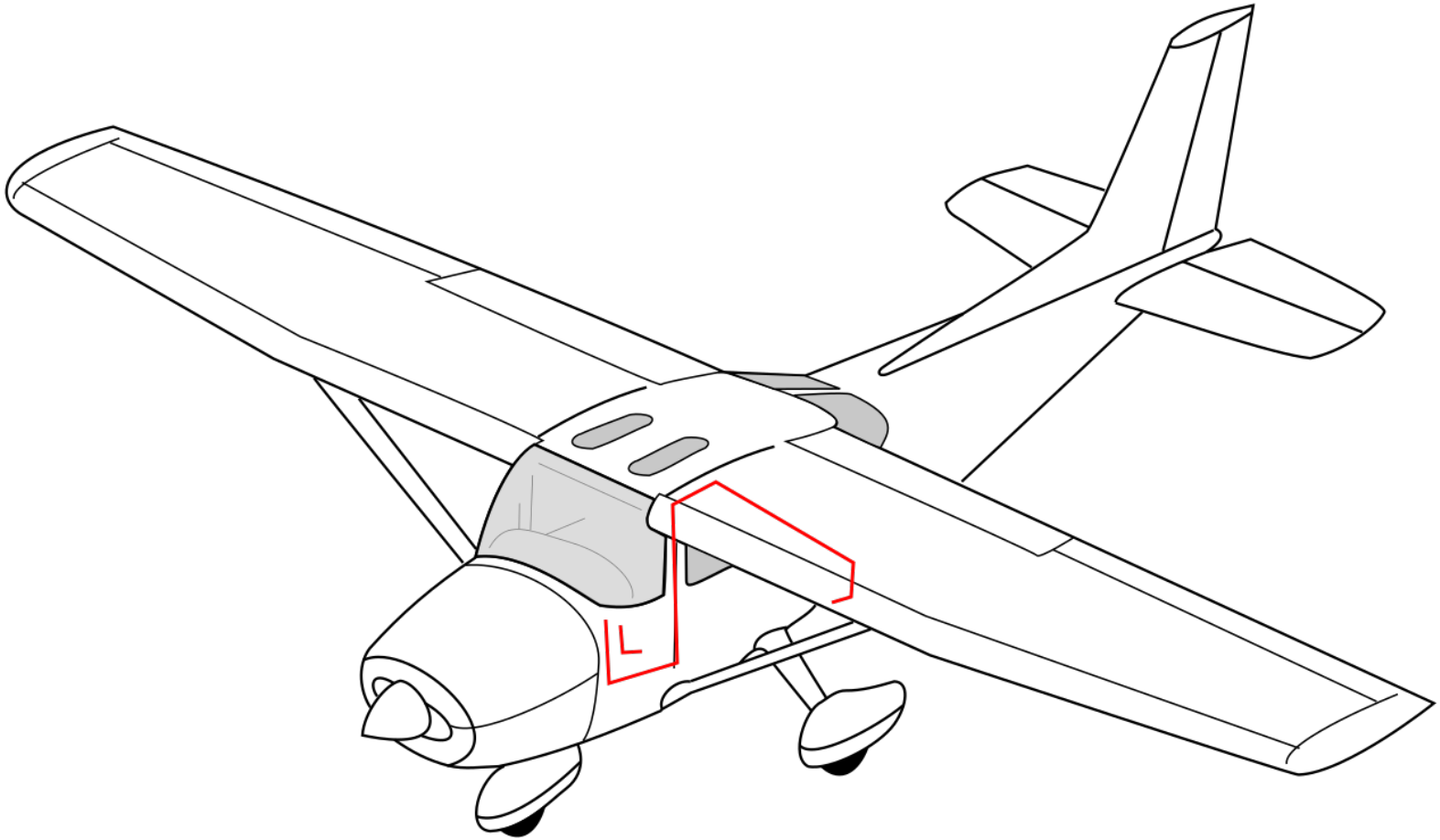
Engine



Electrical



Pitot-Static



Engine Subsystems

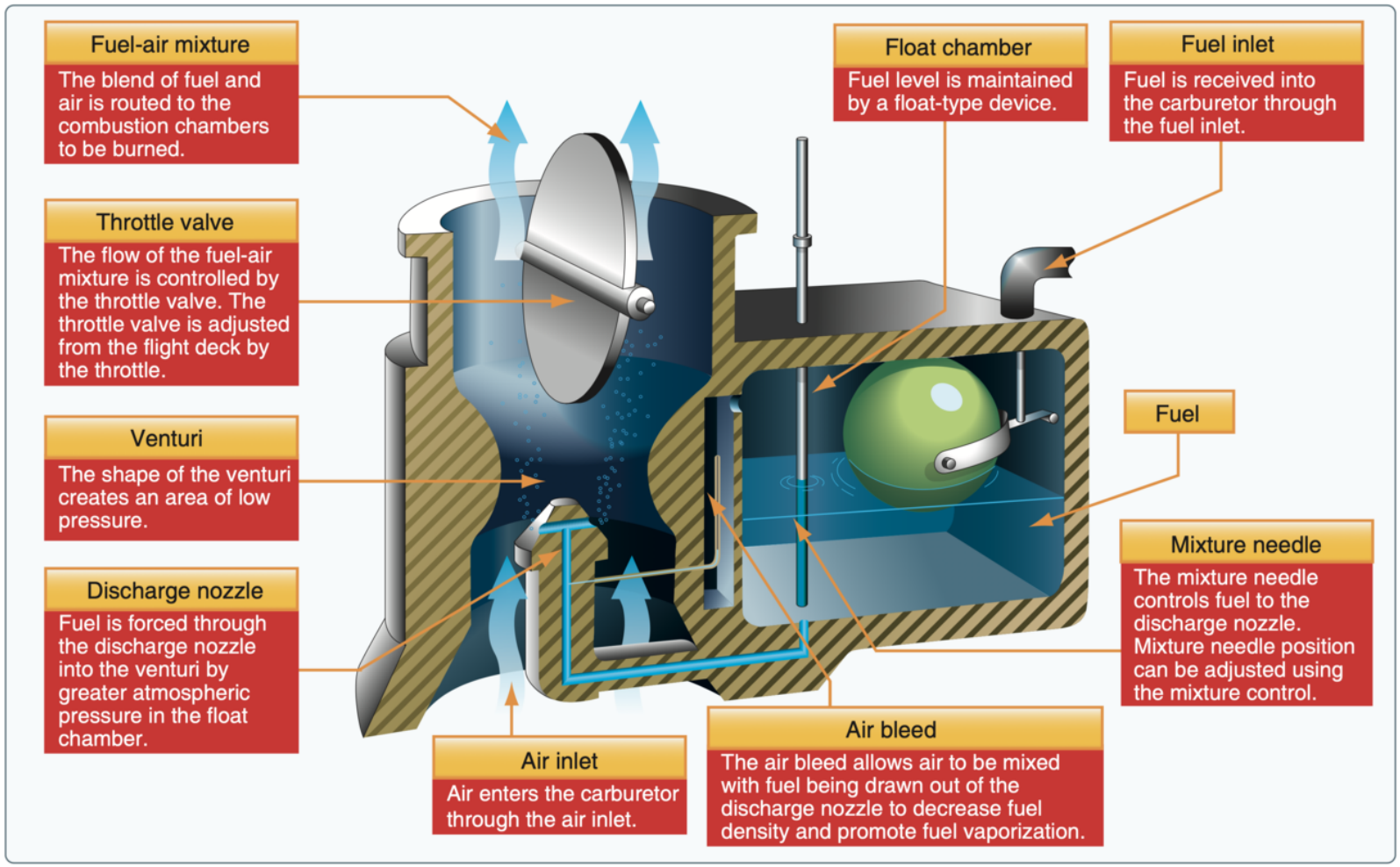
- Induction
- Ignition
- Cooling

Engine Controls

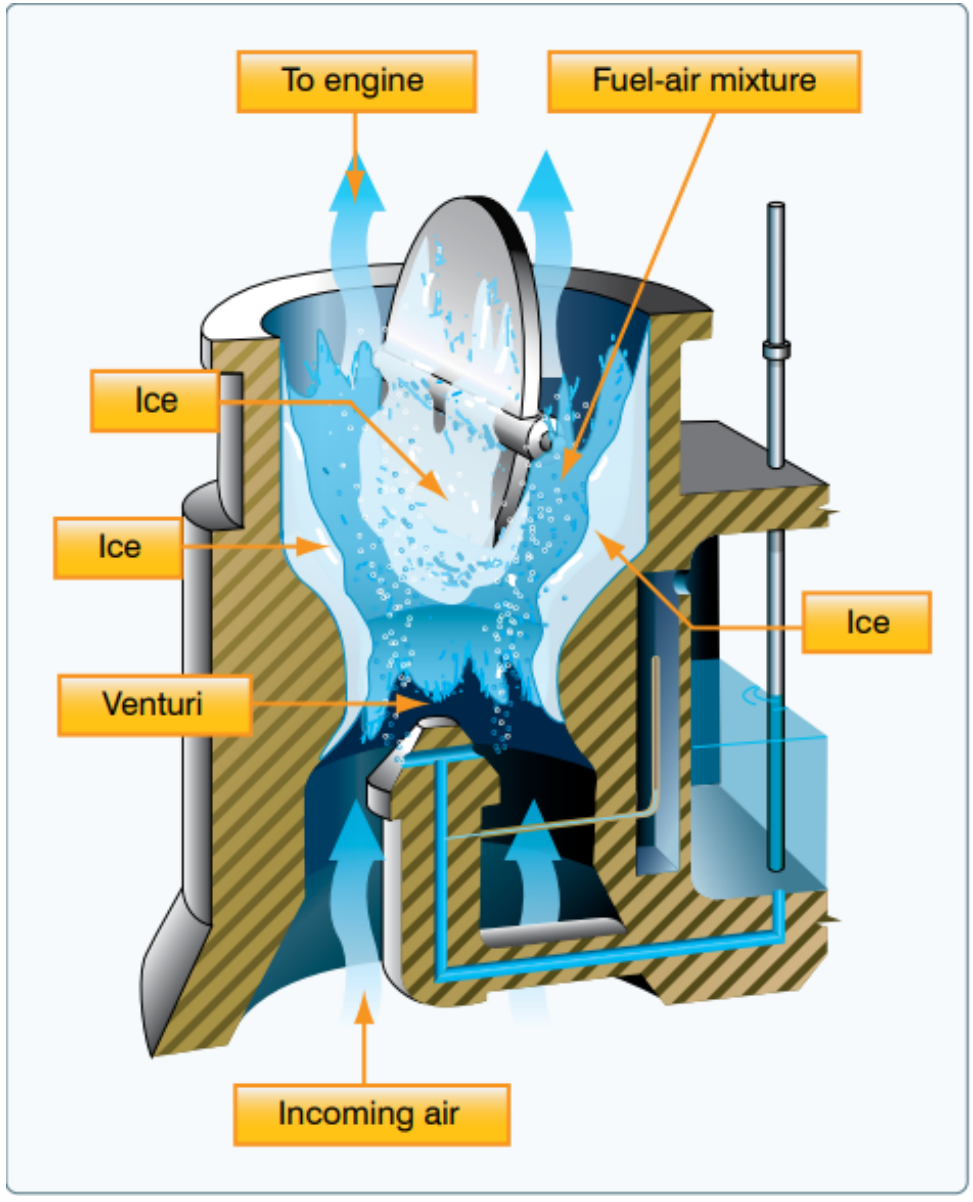
Four Stroke Engine

https://www.youtube.com/watch?v=jdW1t8r8qYc

Carburetor


Fuel-air mixture
The blend of fuel and air is routed to the combustion chambers to be burned.
Throttle valve
The flow of the fuel-air mixture is controlled by the throttle valve. The throttle valve is adjusted from the flight deck by the throttle.
Venturi
The shape of the venturi creates an area of low pressure.
Discharge nozzle
Fuel is forced through the discharge nozzle into the venturi by greater atmospheric pressure in the float chamber.
Float chamber
Fuel level is maintained by a float-type device.
Fuel inlet
Fuel is received into the carburetor through the fuel inlet.
Fuel
Mixture needle
The mixture needle controls fuel to the discharge nozzle. Mixture needle position can be adjusted using the mixture control.
Air bleed
The air bleed allows air to be mixed with fuel being drawn out of the discharge nozzle to decrease fuel density and promote fuel vaporization.
Air inlet
Air enters the carburetor through the air inlet.

Carburetor Icing



Carburetor Icing

https://www.youtube.com/watch?v=pUAb4RKLfKY

Fuel

- Fuel-Air Mixture
  - Detonation & Preignition
- Priming
- Fuel Injection
- Diesel
- Turbo

Fuel-Air Mixture

https://youtube.com/shorts/GpFtTpZGQu8?si=7z2JiGHrNu_eErDo

Turbo

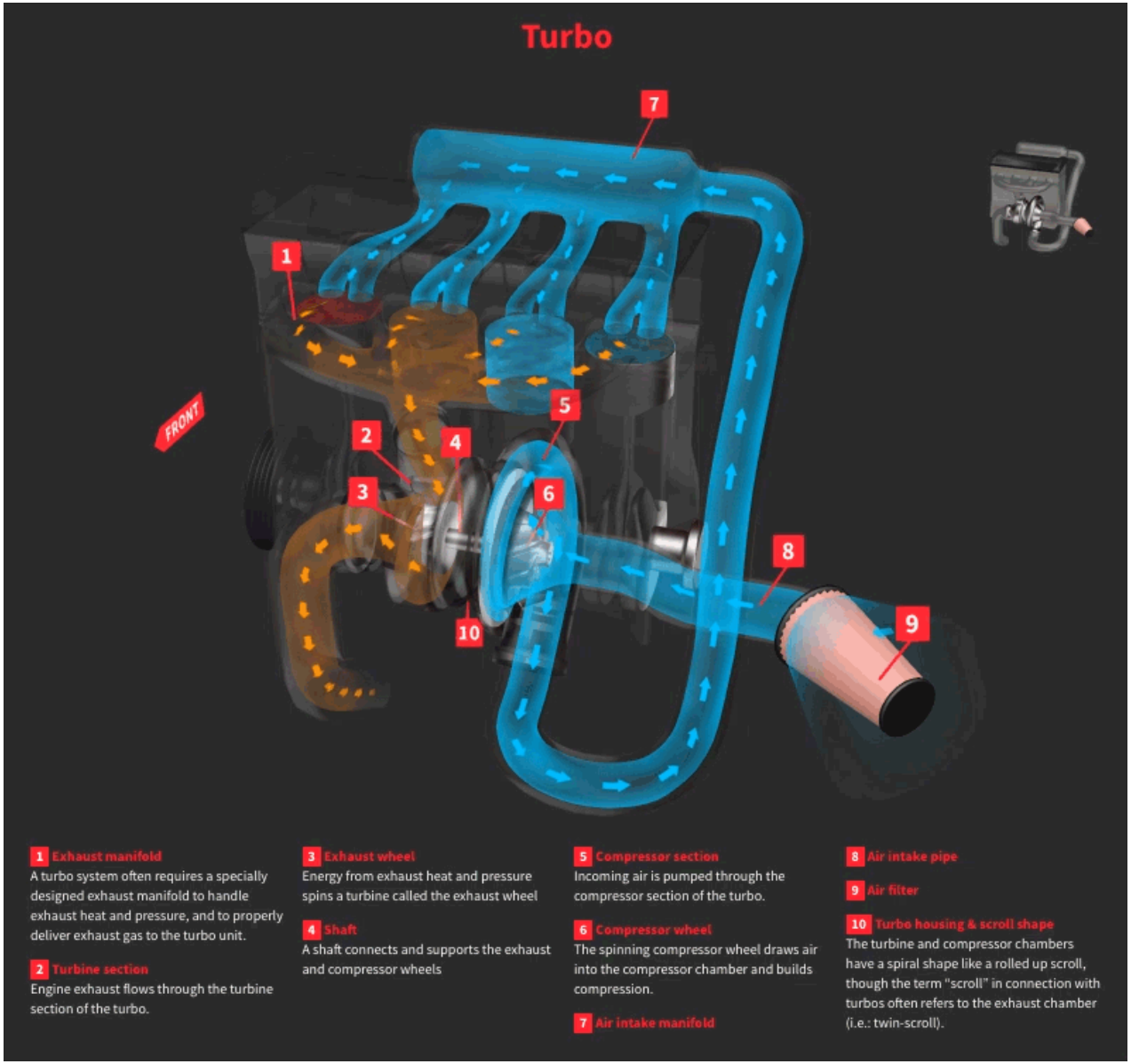


Image by Patricia Writes.

Turbo

https://www.youtube.com/watch?v=gqSHkWaji2g

Turboprop

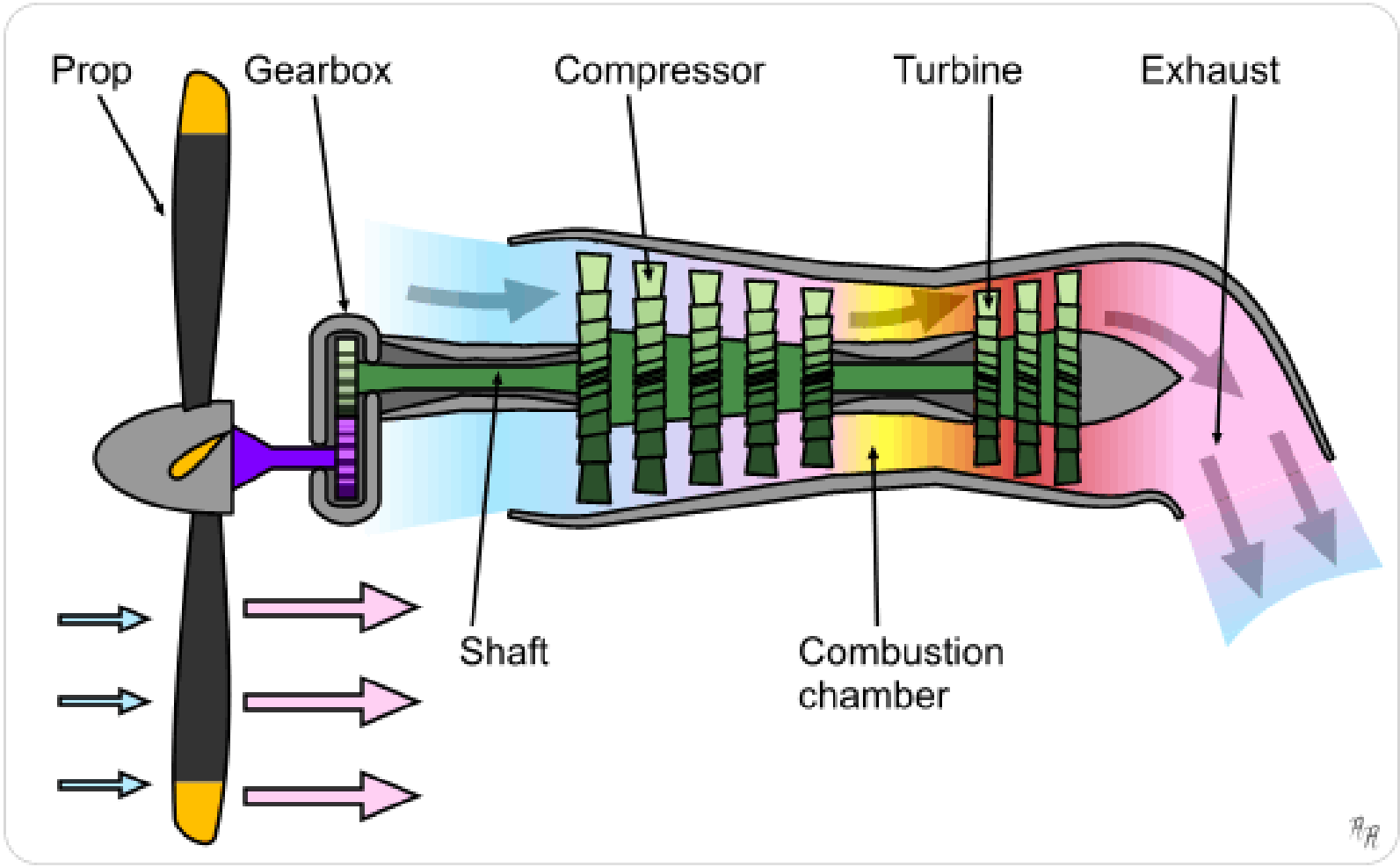


Image by Emoscopes & M0tty

Turboprop

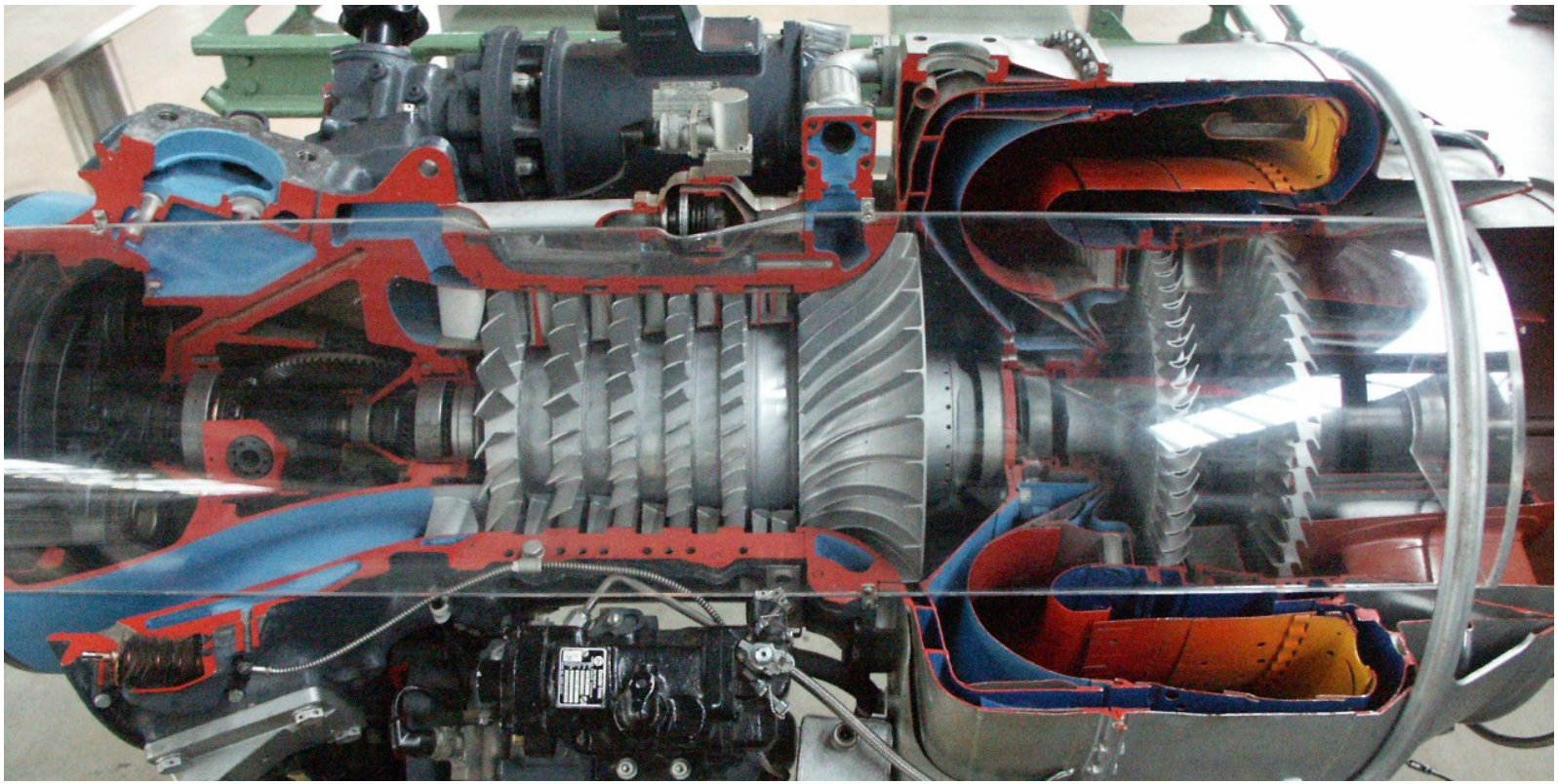


Photo by Sleipnir

Magneto

https://www.youtube.com/watch?v=P5JWuYvf1Jk

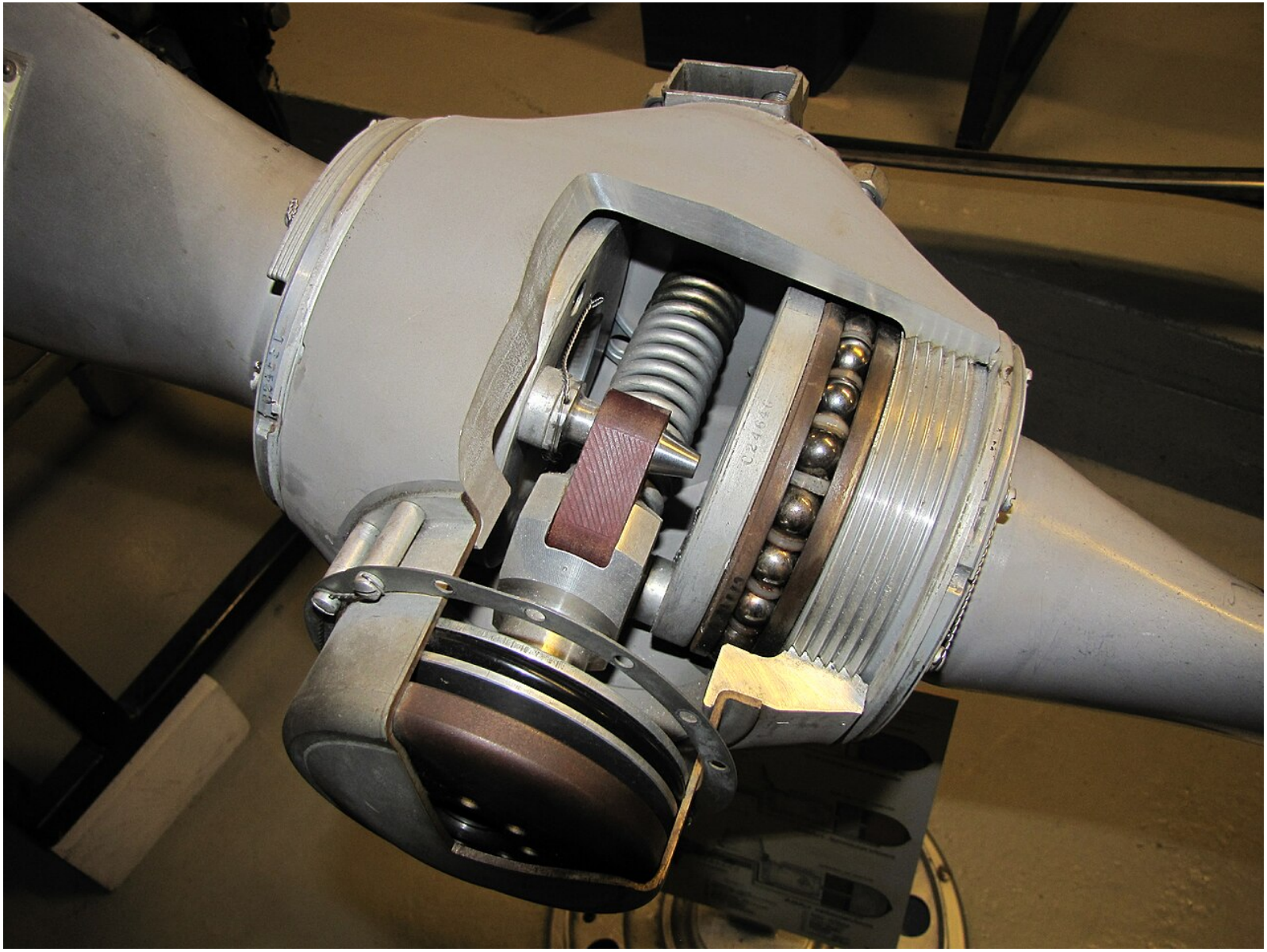
Fuel

- Grade: 80, 100LL, G100UL
- Automotive fuels?
- Fuel Tanks
- Sumps

Electrical

- Engine driving alternator (generator)
- Master
- Circuit Breakers
- Busses

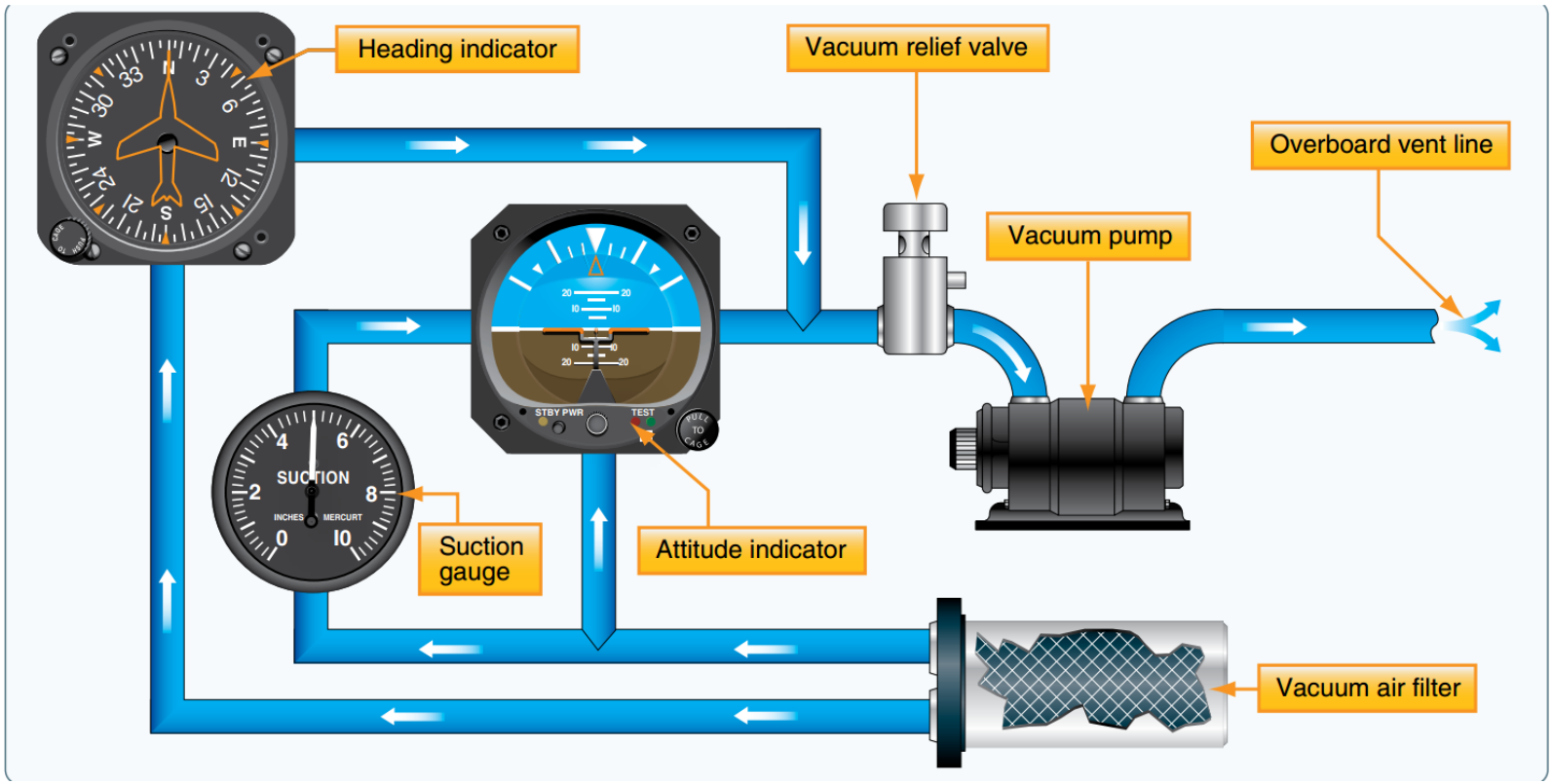
Propeller



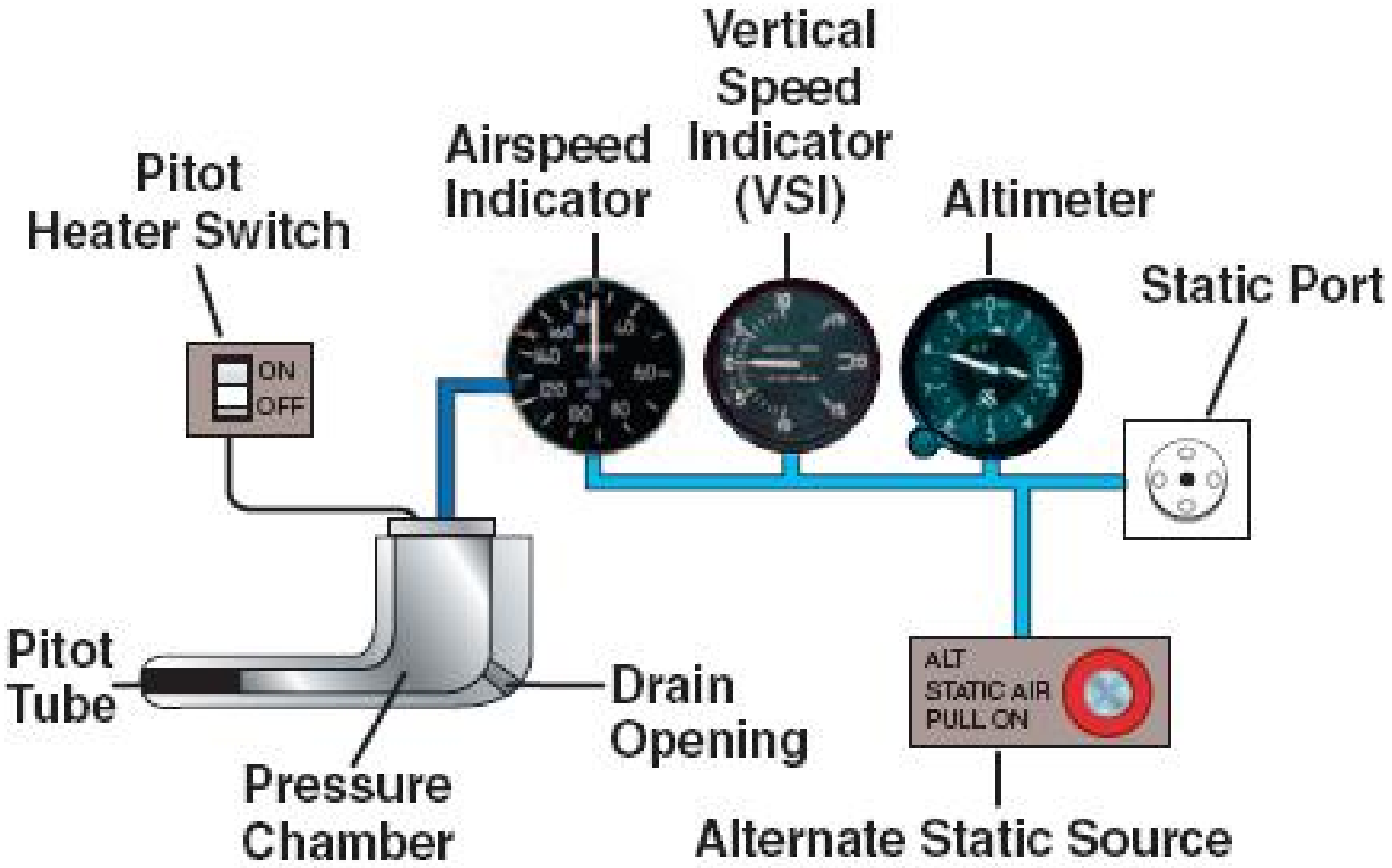
Propeller

Photo by Julian Herzog.

Vacuum System



Pitot-Static



1) What action can a pilot take to aid in cooling an engine that is overheating during a climb?

A Lean the mixture to best power condition.

B Increase RPM and reduce climb speed.

C Reduce rate of climb and increase airspeed.

2) A precaution for the operation of an engine equipped with a constant-speed propeller is to

A avoid high RPM settings with high manifold pressure.

B avoid high manifold pressure settings with low RPM.

C always use a rich mixture with high RPM settings.

3) Filling the fuel tanks after the last flight of the day is considered a good operating procedure because this will

A force any existing water to the top of the tank away from the fuel lines to the engine.

B prevent expansion of the fuel by eliminating airspace in the tanks.

C prevent moisture condensation by eliminating airspace in the tanks.

4) Which condition is most favorable to the development of carburetor icing?

A Any temperature below freezing and a relative humidity of less than 50 percent.

B Temperature between 32 and 50°F and low humidity.

C Temperature between 20 and 70°F and high humidity.

5) The uncontrolled firing of the fuel/air charge in advance of normal spark ignition is known as

A combustion.

B preignition.

C detonation.

6) If the engine oil temperature and cylinder head temperature gauges have exceeded their normal operating range, the pilot may have been

A operating with the mixture set too rich.

B using fuel that has a higher-then-specified fuel rating.

C operating with too much power and with the mixture set too lean.

7) If an engine continues to run after the ignition switch is turned to the OFF position, the probable cause may be

A the mixture is too lean and this causes the engine to diesel.

B a broken magneto ground wire.

C fouled spark plugs.

8) Detonation occurs in a reciprocating aircraft engine when

A hot spots in the combustion charmer ignite the fuel/air mixture in advance of normal ignition.

B there is too rich a fuel/air mixture.

C the unburned charge in the cylinders explodes instead of burning evenly.

9) An abnormally high engine oil temperature indication may be caused by

A the oil level being too low.

B operating with a too high viscosity oil.

C operating with an excessively rich mixture.

10) What type of fuel can be substituted for an aircraft if the recommended octane is not available?

A The next higher octane aviation gas.

B The next lower octane aviation gas.

C Unleaded automotive gas of the same octane rating.

11) In an aircraft equipped with a constant-speed propeller and a normally aspirated engine, which procedure would be used to avoid placing undue stress on the engine components?

A When power is being increased or decreased, the RPM should be adjusted before the manifold pressure.

B When power is being decreased, reduce the RPM before reducing the manifold pressure.

C When power is being increased, increase the RPM before increasing the manifold pressure.

12) The main purpose of the mixture control is to

A adjust the fuel flow to obtain the proper air/fuel ratio.

B increase the oxygen supplied to the engine.

C decrease the oxygen supplied to the engine.

13) Which statement is true regarding the effect of the application of carburetor heat?

A It reduces the density of air entering the carburetor, thus enriching the fuel/air mixture.

B It reduces the density of air entering the carburetor, thus leaning the fuel/air mixture.

C It reduces the volume of air entering the carburetor, thus enriching the fuel/air mixture.

14) What will occur if no leaning is made with the mixture control as the flight altitude increases?

A The volume of air entering the carburetor remains constant and the amount of fuel decreases.

B The volume of air entering the carburetor decreases and the amount of fuel decreases.

C The density of air entering the carburetor decreases and the amount of fuel remains constant.

Accident Case Study

https://www.youtube.com/watch?v=MBL1iy0V9VM